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ISM STRIPPING FROM CLUSTER GALAXIES AND INHOMOGENEITIES IN COOLING FLOWS

NOAM SOKER¹, JOEL N. BREGMAN² AND CRAIG L. SARAZIN¹

¹DEPARTMENT OF ASTRONOMY, UNIVERSITY OF VIRGINIA

² NRAO, CHARLOTTESVILLE, VIRGINIA

Analyses of the X-ray surface brightness profiles of cluster cooling flows suggest that the mass flow rate decreases towards the center of the cluster. It is often suggested that this decrease results from thermal instabilities, in which denser blobs of gas cool rapidly and drop below X-ray emitting temperatures. If the seeds for the thermal instabilities are entropy perturbations, these perturbations must enter the flow already in the nonlinear regime. Otherwise, the blobs would take too long to cool. We suggest that such nonlinear perturbations might start as blobs of interstellar gas which are stripped out of cluster galaxies. Assuming that most of the gas produced by stellar mass loss in cluster galaxies is stripped from the galaxies, the total rate of such stripping is roughly $\dot{M}_{ISM} \sim 100 M_{\odot} \text{ yr}^{-1}$. It is interesting that the typical rates of cooling in cluster cooling flows are $\dot{M}_{cool} \sim 100 M_{\odot} \text{ yr}^{-1}$. Thus, it is possible that a substantial portion of the cooling gas originates as blobs of interstellar gas stripped from galaxies. The magnetic fields within and outside of the low entropy perturbations can help to maintain their identities, both by suppressing thermal conduction and through the dynamical effects of magnetic tension. One significant question concerning this scenario is: Why are cooling flows seen only in a fraction of clusters, although one would expect gas stripping to be very common. It may be that the density perturbations only survive and cool efficiently in clusters with a very high intracluster gas density and with the focusing effect of a central dominant galaxy. Inhomogeneities in the intracluster medium caused by the stripping of interstellar gas from galaxies can have a number of other effects on clusters. For example, these density fluctuations may disrupt the propagation of radio jets through the intracluster gas, and this may be one mechanism for producing Wide-Angle-Tail radio galaxies.

\dot{M}_{subISM} approx. 100
Stellar mass yr⁻¹.

$\dot{M}_{subcool}$ approx.
100 Stellar mass yr⁻¹.